

## Quarterly Report – Public Page

**Date of Report:** 5th Quarterly Report-January 30, 2020

**Contract Number:** 693JK31810011

**Prepared for:** Government Agency: USDOT - PHMSA

**Project Title:** River Scour Monitoring System for Pipeline Threat Prevention

**Prepared by:** Dr. Samuel T. Ariaratnam, Arizona State University

**Contact Information:** Dr. Samuel T. Ariaratnam, ariaratnam@asu.edu, (480) 965-7399

**For quarterly period ending:** December 31, 2019

### 1: Items Completed During this Quarterly Period:

During the 5<sup>th</sup> Quarter, the following items were completed:

<i>Item #</i>	<i>Task #</i>	<i>Activity/Deliverable</i>	<i>Title</i>	<i>Federal Cost</i>	<i>Cost Share</i>
9	6	System Installation #1	Field installation of RSS	\$9,500.00	\$11,500.00
10	6	System Installation #2	Field installation of RSS	\$9,500.00	\$11,500.00
11	6	System Installation #3	Field installation of RSS	\$9,500.00	\$11,500.00
14	6	System Installation #4	Field installation of RSS	\$9,500.00	\$11,500.00
12	3	Evaluation of the impact of Vortex-Induced Vibrations	FEM modeling of data	\$15,000.00	\$4,000.00
26	9	Mid-Point Update Meeting	Issue of update meeting report	\$1,175.00	\$1,175.00
27	8	5 <sup>th</sup> Quarterly Status Report	Quarterly report	\$2,175.00	\$1,000.00

### 2: Items Not-Completed During this Quarterly Period:

The following tasks were not completed during this Quarterly Period:

<i>Item #</i>	<i>Task #</i>	<i>Activity/Deliverable</i>	<i>Title</i>	<i>Federal Cost</i>	<i>Cost Share</i>
15	6	System Installation #5	Field installation of RSS	\$9,500.00	\$11,500.00
16	7	Daily data collection	Collection of field data	\$3,000.00	\$7,500.00
17	7	Monthly analysis of data	Summary report of monthly data	\$10,000.00	\$10,000.00
22	7	Daily data collection	Collection of field data	\$3,000.00	\$7,500.00
23	7	Monthly analysis of data	Summary report of monthly data	\$10,000.00	\$10,000.00
24	2	System Upgrade (version 4.0)	Upgrading of system	\$18,000.00	\$18,000.00
25	5	Software/Website Upgrade (version 3.0)	Upgrading software/website	\$15,000.00	\$15,000.00

**Item 15, Task 6** – System Installation at Site #5 is scheduled to take place during the first week of February 2020 near Swan Hills, Alberta Canada.

**Item 16/22, Task 6** – Daily data collection, we are currently collecting data from four recent installations of the River Scour Monitoring Systems that were deployed in late November and December.

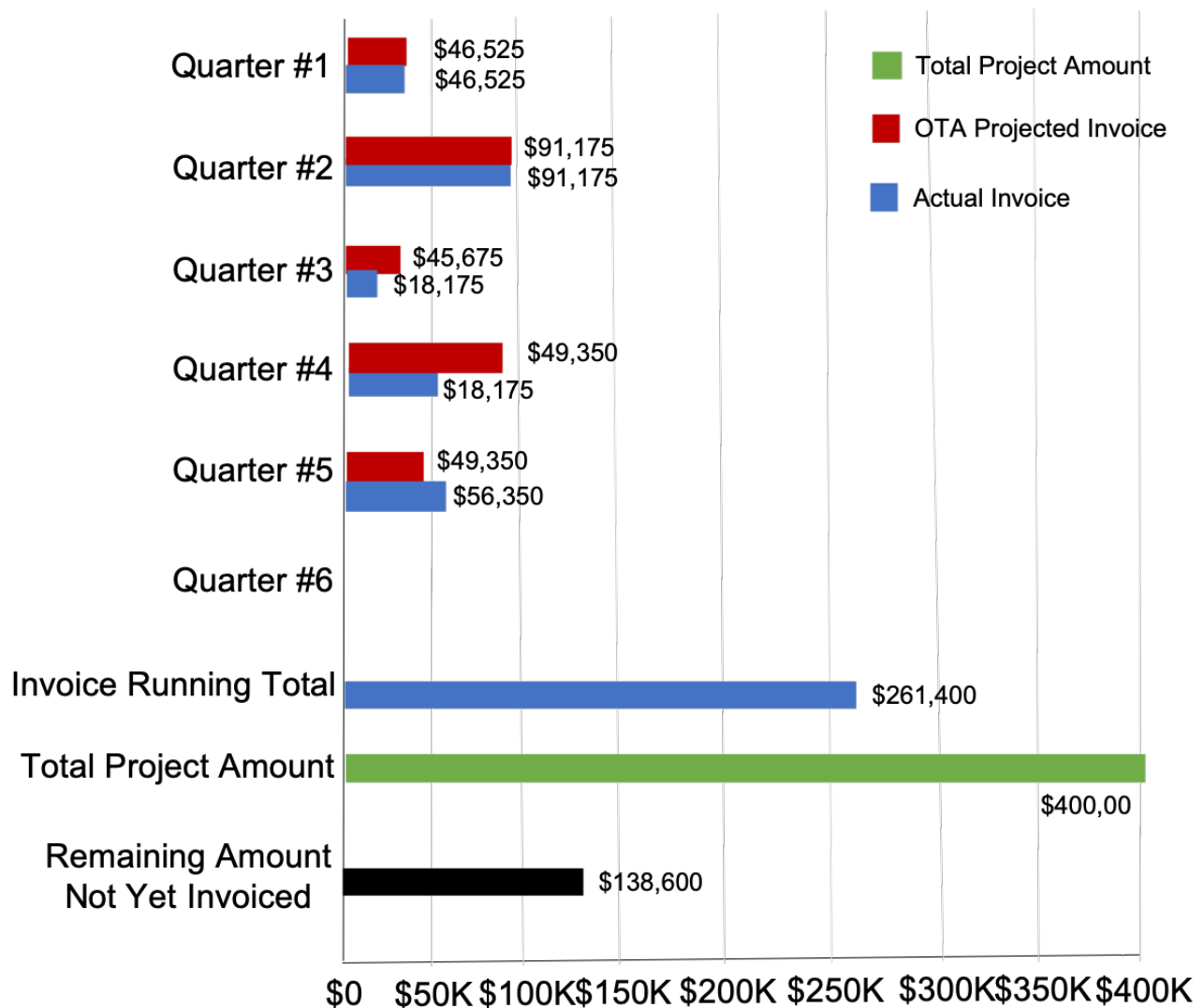
**Item 17/23, Task 7** – Monthly analysis of data, we will analyze the collected data from the four recent installation at the end of this month.

**Item 24, Task 2** – System Upgrade (version 4.0), we are currently working on integrating a camera into the system to give a visual indication of the river status. We are still in the early discovery phase of finding an off the shelf product that can be tied into the existing above ground electronics, but it is progressing.

**Item 25, Task 5** – Software/Website Upgrade (version 3.0), there have been discussions in our planning meetings, however the software team is unavailable to work on this item this quarter. It is scheduled to be worked on in Q2 of this year.

### 3: Project Financial Tracking During this Quarterly Period:

#### Quarterly Payable Milestones/Invoices - 693JK31810011



#### 4: Project Technical Status

##### *River Scour Monitoring System (RSS) Installations*

**Item #9, Task #6** – Installation #1 was completed on November 20, 2019 under the Tongue River in Pembina County, North Dakota. Three sensors were placed on the pipeline; two upstream and one downstream. Conventional trenchless methods were used to expose the pipeline for the sensor installation.

**Item #10, Task #6** – Installation #2 was completed between November 18-20, 2019 under the Tongue River in Pembina County, North Dakota. Three sensors were placed on the pipeline; two upstream and one downstream. Conventional trenchless methods were used to expose the pipeline for the sensor installation.

One of the River Scour Monitoring Systems (RSS) was placed to monitor a buried pipeline, while the other was placed to monitor a parallel exposed pipeline. This provides an excellent comparison of the operation efficiency of the RSS. Figure 1 illustrates the sensor installation, while the two installed RSS units are shown in Figure 2.



**Figure 1. Sensor Installation at the Tongue River in North Dakota**



**Figure 2. River Scour Monitoring Systems at the Tongue River in North Dakota**

**Item #11, Task #6** – Installation #3 was completed between December 3-7, 2019 under the Elk River, a tributary of the Verdigris River, in Southeast Kansas. Three sensors were placed on the pipeline; two upstream and one downstream. Limited access and depth of cover necessitated the use of potholing to install the sensors.

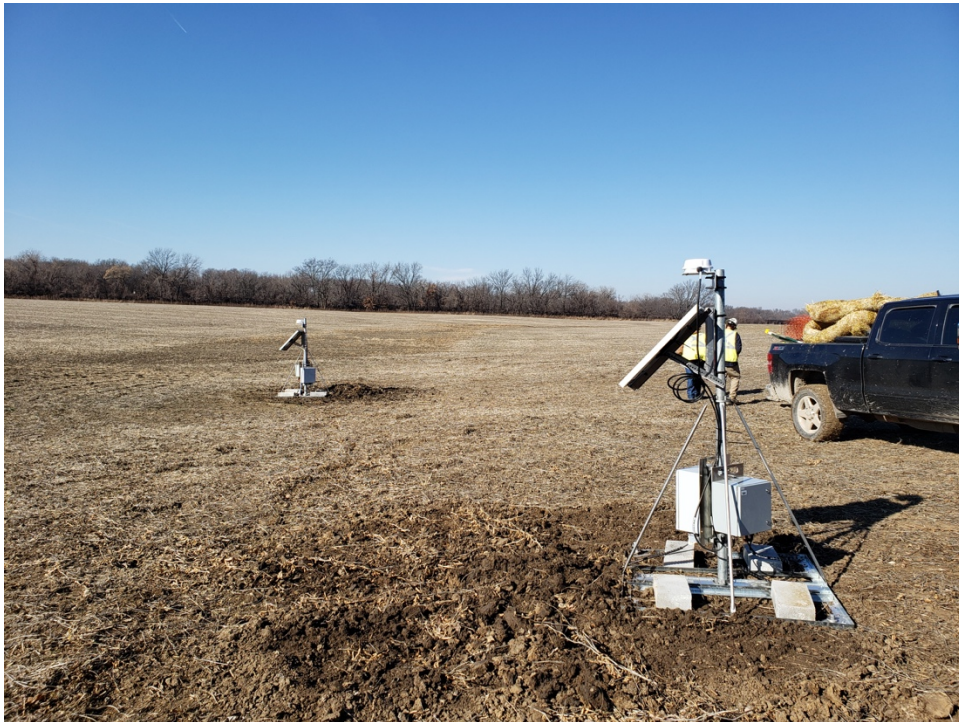
**Item #14, Task #6** – Installation #4 was completed between December 3-7, 2019 under the Elk River, a tributary of the Verdigris River, in Southeast Kansas. Three sensors were placed on the pipeline; two upstream and one downstream. Limited access and depth of cover necessitated the use of potholing to install the sensors.

Similar to the Tongue River crossing, one River Scour Monitoring Systems (RSS) was placed to monitor a buried pipeline, while the other was placed to monitor a parallel exposed pipeline. This provides an excellent comparison of the operation efficiency of the RSS. Figure 3 illustrates the sensor installation on the pipeline, while the two installed RSS units are shown in Figure 4.



**Figure 3. Sensor Installation at the Elk River Crossing in Kansas**





**Figure 4. River Scour Monitoring Systems at the Elk River Crossing in Kansas**

### ***Vortex-Induced Vibrations (VIV)***

**Item #14, Task #6** – Continued model development to better understand Vortex-Induced Vibration (VIV) in exposed pipelines is ongoing. Data from RSS units at the Trans Mountain Pipeline Crossing of the North Thompson River in British Columbia (Canada) in 2018 are being used in model development. Population of data collected from the current four installations will help in further developing this model.

## **5: Project Schedule**

The project is slightly behind schedule due to permitting issues. These have been resolved and four installations of the River Scour Monitoring Systems (RSS) have been complete in North Dakota and Kansas. A fifth installation for Pembina Pipelines is scheduled for the Q1 2020 in Swan Hills, Alberta Canada. There may be two to three installations on this crossing. We have started collection of data using remote communication and will start analyzing these collected data. Furthermore, System Upgrade (v. 4.0) and Software/Website Upgrade (v. 3.0) are expected to be completed within the next six months.

Now that we have installed RSS units, the project should progress in a timely manner without any anticipated issues.